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Hoosier
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Report for the Houston South Restoration Environmental Assessment

Effects to Aquatic Resources

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Table of Contents

Resource Impacts or Issue(s) Addressed

This section discloses the issues and potential impacts identified during interdisciplinary meetings and scoping. This is the fish and aquatic resource report associated with the proposed Houston South Restoration project. The proposed actions will occur in Jackson and Lawrence Counties, Indiana. The resource concerns are:

- Impacts to aquatic organisms in streams
- Impacts to aquatic organisms in ponds
- Impacts to habitat associated with streams and ponds

Concerns about increased sedimentation in the watershed that drains the project area developed during public scoping that directly related to aquatic resources.

Scope of the Analysis

The spatial boundary used to evaluate direct, indirect, and cumulative impacts is the perennial streams and ponds within the project area in the Houston South Restoration project. Potential impacts could occur outside of the project areas as streams are dynamic and impacts do not just affect one area and stay there. Aquatic organisms such as fish are highly mobile as long as there are no barriers to limit migration. Any deleterious impacts would be more severe to pond species because these organisms would not be able to move out of the project area.

The temporal boundary used to evaluate direct, indirect and cumulative impacts began in 2017 when fish sampling commenced in streams throughout the project area. Sampling to monitor aquatic species and habitat will continue through and after the implementation of proposed actions to discern how aquatic species and habitats were affected by proposed actions.

Direct impacts would be seen within a week in stream sections and ponds within the project area. It would be more likely to see the effects of impacts in ponds.

Methodology

Streams within the project area were sampled for fish with the use of electrofishing equipment. Sites were chosen based on ease of access, adequate habitat that would be used by native stream fishes and to give an overall view of the watershed within the project area. Each site was measured so that the sampling could be repeated year to year within the same stream reach. The length of each site was determined by measuring an average width and multiplying the average by 15. This is the method used by the Indiana Department of Environmental Management (IDEM).

The Index of Biotic Integrity (IBI) is the system that is used to assess the local fish communities. The IBI was developed by Dr. James Karr in 1981 as a tool for assessing water/stream quality based on the fish communities that are present. The IBI is a great tool in that complex biological information can be analyzed to provide measurements of stream quality for non-biologists and members of the general public. The IBI is comprised of 3 broad categories (species composition, trophic composition, and fish condition) which are broken down into 12 smaller categories, known as metrics. These metrics are given a score based on their similarity to least impacted (reference) sites. One of 3 scores can be given for each metric: 1 (not similar to reference conditions), 3 (somewhat similar to reference conditions), or 5 (very similar to reference conditions). In general, the total score for a site will range from 12 to 60, but in an instance where no fish are present at a site, a score of 0 is given. These scores can then be graphed and placed into 1 to 5 classifications (very poor, poor, fair, good, or excellent), which describes the overall condition of the fish community being monitored.

Stream habitat at each site was analyzed with the Qualitative Habitat Evaluation Index (QHEI). The QHEI is similar to the IBI in its structure. It was developed by Ed Rankin of Ohio EPA in 1988 to complement the IBI for use in Midwestern streams. The QHEI has 6 broad categories which are broken down into 21 smaller categories or metrics. This index will have a final score of 0 to 100 and the scores will be classified as excellent, good, fair-good, poor, and very poor. This assessment helps determine to what extent the IBI scores are being affected by habitat. It can also help identify specific habitat degradation issues that need to be addressed.

Ponds in the project area were sampled with standard minnow funnel traps. Four minnow traps were placed into five ponds each day and allowed to soak overnight. Traps were retrieved the following day, sanitized and place into new ponds. The traps are used to inform biologists on what organism groups utilize each individual pond.

Aquatic benthic macroinvertebrate sampling will take place in the project area in the summer of 2019. This will provide another data set of biological information prior to any activities occurring on the ground.

Existing Conditions of the Affected Environment

Nine sites on nine different streams were sampled for fish community diversity in 2017 and 2018. The same 9 sites will be sampled again in 2019 to establish a 3 year baseline to be used to compare against when future sampling is performed. A total of 32 native fish species were collected from the sites, shown in the following table. The most abundant species was creek chub (*Semotilus atromaculatus*), followed by central stoneroller (*Campostoma anomalum*).

2017-2018 Houston South Species		
Genus	**Species**	**Common Name**
Lampetra	aepyptera	least brook lamprey
Esox	americanus	grass pickerel
Semotilus	atromaculatus	creek chub
Notropis	boops	bigeye shiner
Ericymba	buccata	silverjaw minnow
Campostoma	anomalum	central stoneroller
Pimephales	notatus	bluntnose minnow
Luxilus	chrysocephalus	striped shiner
Lythrurus	fumeus	ribbon shiner
Catostomus	commersoni	white sucker
Erimyzon	oblongus	creek chubsucker
Moxostoma	erythrurum	golden redhorse
Hypentelium	nigricans	northern hog sucker
Noturus	gyrinus	tadpole madtom
Noturus	miurus	brindled madtom
Pylodictus	olivaris	flathead catfish
Ameiurus	natalis	yellow bullhead
Aphredoderus	sayanus	pirate perch
Fundulus	notatus	blackstripe topminnow
Ambloplites	rupestris	rock bass

Lepomis	cyanellus	green sunfish
Lepomis	gulosus	warmouth
Lepomis	macrochirus	bluegill
Lepomis	megalotis	longear sunfish
Micropterus	salmoides	largemouth bass
Micropterus	punctulatus	spotted bass
Pomoxis	annularis	white crappie
Pomoxis	nigromaculatus	black crappie
Etheostoma	spectabile	orangethroat darter
Etheostoma	nigrum	johnny darter
Etheostoma	flabellare	fantail darter
Percina	caprodes	logperch

The fish communities observed in the streams within the project boundary are a mix of common species found in southern Indiana (Simon, 2011). Fantail darters are species indicative of headwater streams and this species was present at 7 of 9 sampling sites. Headwater streams are an extremely important part of any riverine ecosystem (Lowe and Likens, 2005). Primary production takes place in headwater streams and the energy produced is cycled downstream to fuel biological communities. Headwater streams are important as spawning, nursery and rearing areas for native fish species. The reason many fish species move upstream in the spring is to spawn in headwater tributaries.

Several of the most abundant species collected are considered pioneer species (Simon and Dufour, 2005). This includes creek chub, central stoneroller, orangethroat darter (*Etheostoma spectabile*) and a few others. The term pioneer species usually has a negative connotation. Pioneer species refers to species that are the first to re-colonize an area after a disturbance or impact. In these streams, the largest disturbances are the extremely flashy nature of the local hydrology that leaves much of the stream dry during the summer and can quickly rise and flood during spring rains. These pioneer species are able to sustain themselves in shallow pools until rain events affect the flow regime. In these watersheds, this is a natural phenomenon. However, these streams are very susceptible to other anthropogenic disturbances.

The results of the first 2 years of fish sampling within the project area are shown in the following tables.

2017 Houston South Fish Survey Results						
Stream	**Station**	**# Species**	**IBI**	**Rating**	**QHEI**	**Rating**
Negro Creek	CR 1190 W	15	30	Poor	58	Good
Callahan Branch	CR 825 N	8	22	Very Poor	70	Excellent
Kiper Creek	SR 135	8	30	Poor	57.5	Good
Trib L. Salt Creek	Thompson Cemetery	5	30	Poor	55	Good
Tipton Creek	CR 980 W	15	36	Fair	59	Good
S Fork Salt Creek	CR 825 N	21	46	Fair	73	Excellent
Little Salt Creek	Buffalo Pike	23	42	Fair	67.5	Good

Trib S F Salt Creek	CR 825 N	Dry at time of sampling
Trib Tipton Creek	CR 980 W	Dry at time of sampling

2018 Houston South Fish Survey Results						
Stream	**Station**	**# Species**	**IBI**	**Rating**	**QHEI**	**Rating**
Negro Creek	CR 1190 W	6	20	Very Poor	61	Good
Callahan Branch	CR 825 N	5	30	Poor	72	Excellent
Kiper Creek	SR 135	7	24	Poor	45	Fair
Trib L. Salt Creek	Thompson Cemetery	4	22	Poor	57	Good
Tipton Creek	CR 980 W	14	32	Poor	58	Good
S Fork Salt Creek	CR 825 N	20	44	Fair	70	Good
Little Salt Creek	Buffalo Pike	18	42	Fair	68	Good
Trib S F Salt Creek	CR 825 N	3	18	Very Poor	46	Fair
Trib Tipton Creek	CR 980 W	1	16	Very Poor	54	Fair

As can be observed from the above tables, IBI scores are fairly correlated with number of species. Hence the more species collected, the higher the IBI in most cases for these 9 sites. The outlier site in 2017 was Negro Creek. While Negro Creek had nice diversity, 74 of the 132 specimens collected were creek chubs. Creek chubs are highly tolerant omnivores. A high percentage of creek chubs will lead to low IBI scores. IBI scores also get higher as we move downstream in the watershed and the individual sites have a larger drainage area. For this particular watershed, it makes sense since the upper reaches start to dry up and cannot support large numbers of fish or high diversity. The low IBI scores on the upstream sites are attributed to the hydrology and the number of tolerant and pioneer species present at the time of sampling. IBI scores increase slightly as sampling moved downstream. More species were present and larger numbers of intolerant and specialist species were collected.

None of the 9 sites sampled could be labeled as extremely healthy stream reaches from a biological standpoint. The Indiana Department of Environmental Management (IDEM) states that an IBI score of 36 or higher means the stream is at least minimally functioning for aquatic life usage. Four of the seven sites fall below this line and would be eligible to be placed on the 303(d) list for impaired waters.

However, IBI scores can sometimes be misleading. It is currently the best tool we have to assess in stream aquatic health. The fact that 15 species were found in Negro Creek with a drainage area just over 5 square miles is quite impressive. Over 20 native species were collected at the two main stem Salt Creek sites.

QHEI scores all rated good to excellent on average for the 9 sites, so habitat does not seem to be a limiting factor. The extremely flashy hydrology is playing a major role in the ecological health of these watersheds. Water quality data were collected at these sites. There are no concerns with water temperature, dissolved oxygen or pH at any of the 9 sites.

Ponds in the area consist of either fish bearing or non-fish bearing ponds. Fish species commonly found in small ponds include bluegill (*Lepomis macrochirus*), warmouth (*Lepomis*

gulosus), green sunfish (*Lepomis cyanellus*), blackstripe topminnow (*Fundulus notatus*), golden shiner (*Notemigonus crysoleucas*) and fathead minnow (*Pimephales promelas*). The ponds may also contain varying life stages of American bullfrog (*Lithobates catesbeianus*), green frog (*Lithobates clamitans*) and eastern newt (*Notophthalmus viridescens*).

Non-fish bearing ponds and pools are important breeding areas for Jefferson salamander (*Ambystoma jeffersonianum*), spotted salamander (*Ambystoma maculatum*), marbled salamander (*Ambystoma opacum*) and wood frog (*Rana sylvatica*). Of the 25 ponds sampled in the project area in the spring of 2018, 20 were found to have breeding populations of either wood frog, spotted salamander or Jefferson salamander. Many contained all 3 species. The ponds throughout the project area appear to be very productive and are an important habitat resource for native herptofauna.

Environmental Consequences (Effects) by Alternative

Alternative A – Proposed Action

Possible negative effects of the proposed action include increased sedimentation, herbicide contamination, and potential habitat loss for aquatic resources. Any realized negative effects would be short term and occur during implementation. There are inherent consequences to timber harvesting, prescribed fire and herbicide treatments to aquatic resources. Having well thought out plans can minimize the risks associated with these procedures.

The Hoosier's Forest Plan has guidelines for harvesting timber near ponds and in riparian areas. Timber personnel consult with other specialists including the fish biologist to implement these guidelines where appropriate. For example, if a small pond is surrounded by non-native pine, it is more beneficial to remove as much of the pine as possible compared to strictly adhering to the buffer guideline in the Forest Plan. There is always a buffer area in place to protect riparian areas. Best Management Practices (BMPs) are implemented for any harvesting activity on the Hoosier. These BMPs are monitored annually to check for efficiency in reducing erosion. When a system of BMPs are implemented, the loss of sediment and nutrients can be greatly reduced as a result of silvicultural activities (Wynn et. al, 2000).

Aust and Blinn (2004) synthesized research of foresty BMPs on the effects to water quality and productivity over a 20 year period in the Eastern United States. The results from the large amount of research indicate that BMPs that minimize soil and litter layer distubance, facilitate rapid regeneration and control overland flow of water do effectively minimize negative water quality effects of harvesting and site preparation. Most water quality problems assocaited with forest harvesting are actually problems caused by poorly designed and constructed roads and skid trails, inadequate closure of roads ans skid trails, stream crossings, excessive exposure of bare soil, or lack of adequate Streamside Management Zones (SMZs) (Aust and Blinn, 2004).

The use of SMZs or riparian buffer zones in harvest operations can help protect biological communities that rely on riparian habitat. Maigret et. al (2014) found that when ephemeral streams are protected with SMZ regulations, declines in salamander abundances can be mitigated. Results from Semlitsch et. al (2008), stregthen recommendations to manage and harvest timber in small plots to allow forest dependent, pond breeding amphibians to shift habitat to increase survival and increase th epotential for subsequent recolonization after succession. Their results also show that evacuation of pond breeding salamanders is reduced

by the presence of high amounts of down wood and stregthens management recommendations to retain down wood on clearcuts. Sampling done by Hoosier biologists in ponds in or near clearcuts in the Jeffries timber sale in 2016 showed over 400 adult breeding salamanders in 4 minnow traps. The clearcut took place in 2014 and 2 years later showed little negative affect on the native salamander population.

There will be some short term impacts to aquatic species in the Houston South project area due to timber harvesting. If the correct BMPs are installed and utilized correctly, these impacts will be minimized and short-lived.

Concerns about reintroducing fire to the landscape are impacts to water quality and increased sedimentation. Results from recent studies have shown that low intensity, low severity precribed burns could be used to restore vegetation structure and composition in mixed pine-hardwood ecosystems without negatively impacting water quality (Elliot and Vose, 2005). Lower intensity burns help keep the forest floor intact, thus limiting nutrient and sediment mobilization. Singh et. al (2017) conducted research in Southern Illinois that showed similar results on steep topography. Their prescibed fires reduced litter depth with no difference in soil moisture content. Even in one waterhsed that contained a seep, the total suspended solids and sediment concentrations and loads were not increased significantly due to prescribed burning in mixed hardwood forests.

During prescribed fire operations, the use of ATV/UTV and portable pumps can lead to erosion and contamination issues. As mentioned in the proposal, stream channels are often used as fire lines. When this is the case, ATV/UTV travel through the stream is sometimes necessary. This causes un-natural erosion and sedimentation to the stream. ATV/UTV trails can also rut during wet periods and filter storm water quickly to a stream. This results in excessive sediment reaching a stream before the stormwater can be filtered naturally. Project design critera would prevent these effects to aquatic habitats.

Placing pumps near streams and ponds as a water source for prescribed fires can be detrimental to aquatic organisms. Salamander breeding in ponds usually coincides with spring burns. Egg masses in ponds are at risk of being buried when pond sediment is disturbed during pump installation and removal. Chemical spills can also happen when pumps are re-fueled or not properly cleaned before being placed near a pond or stream bed. This can lead directly to organism kills if toxicity levels are high.

As with timber harvesting, prescribed burning could have short term impacts on aquatic organisms in the Houston South project area. However, if proper BMPs are in place prior to implementation of each burn, impacts can be minimized or non-existent.

Overspray and haphazard application of herbicides can be detrimental to aquatic organisms. Many terrestrial herbicides are lethal to ponds and streams. If untrained staff applies herbicide in the project area, negative effects will be realized on aquatic resources.

Streams within the project area are already slighty impaired based on the fish community composition. Hydrology in these streams is a large reason that more robust fish populations can not be sustained. Any increase in sedimentation to the streams would potentially lower the ability for the streams to maintain the level of biotic integrity exists. It is essential that properly installed BMPs be used throughout the life of this project.

Most of the ponds within the project are constructed as pits that capture rainfall and then slowly dry during periods with little to no precipitation. These ponds will see little to no effect from

sedimentation as they are surrounded by high berms. Some of the ponds in the project area do have levees that back up flow from small ephemeral streams and could receive an influx of sediment from project activities. The use of BMPs will be critical to reduce the potential for increased sedimentation effects to these ponds.

The propoosed construction of aquatic organism passage (AOP) structures within the project area will have direct benefits to aquatic organisms and their habitats. All three proposed AOPs would replace undersized and obsolete infrastructure that prohibits upstream movement of not only fish but other aquatic species and even terrestrial species that use riparian areas as travel routes. The current structures also impair natural hydrologic stream functions such as sediment and woody material transport as well as casuing un-natural erosion and channel incision.

Alternative B – No Action

The No-Action Alternative proposes no riparian or stream channel disturbing construction activities. Without the activities, the project area aquatic resources would continue in a relatively un-disturbed state. No AOP construction activities would occur and aquatic organisms would continue to be cut-off from available upstream habitat. Overall habitat near each undersized culvert would continue to degrade due to un-natural hydrology caused by each structure currently comprising the road-stream crossing. The only effects would come from previously authorized Forest projects or from activities from private land.

Past, Ongoing, and Reasonably Foreseeable Actions

Timber harvesting has occurred within the project area on both federal and private land in the past. Harvesting on federal land occurred on federal land under prior NEPA decisions. Harvesting in or near the project area on private land is likely to occur well after the life of the current project, but to what extent is unknown. Prescribed burning has occurred on a small scale within the project area under past NEPA decisions. These previously authorized burn activities will continue in the future regardless of the current proposed project. The Hoosier has forest wide authorization to use herbicides for non-native invasive species control. This activity will continue throughout the forest during and after the life of the Houston South project. BMPs associated with all these techniques will be utilized to best ability to limit potential impacts.

Cumulative Effects

Alternative A – Proposed Action

As mentioned in the Environmental Consequences section, there are potential impacts associated with timber harvesting, prescribed fire and herbicide application. Areas within the Houston South project area have been treated with these techniques in the past and will continue with the implementation of this project. These treatments will continue into the unforeseeable future. Eventually erosion and sedimentation will become noticeable if not properly accounted for. If properly incorporated BMPs are utilized throughout the life of the project, impacts from sedimentation will be reduced. If BMPs are not properly utilized, cumulative effects of increased sedimentation and erosion will reduce the integrity of stream fish communities.

Replacement of undersized culverts in streams will result in beneficial effects to aquatic biological communities. If all three proposed AOPs are constructed, the overall health of the Salt Creek watershed will improve and beneficial effects will be realized for miles both upstream and downstream of the implementation sites.

Alternative B – No Action

There are no cumulative effects of the no action alternative.

Consistency with the Forest Plan

The goals of the project are consistent with the Forest Plan

- Conservation of Threatened and Endangered Species Habitat
- Maintain and Restore Sustainable Ecosystems
- Maintain and Restore Watershed Health

Consistency with Laws, Regulations, and Handbooks

- All alternatives would be implemented in a manner consistent with Forest Service laws, regulations, and handbooks regarding management of the aquatic resources.

Recommended Design Measures to Address Aquatic Resource Concerns

- Cross streams with ATV/UTV (only when necessary) at 90 degrees
- Avoid driving ATV/UTV over wet, already rutted paths
- Check for egg masses or spawning beds before placing pump hoses in ponds
- Only trained herbicide applicators
- Don’t apply non-aquatic herbicide near ponds or streams
- Follow Forest Plan guidelines for harvesting near riparian areas
- Consult with fish biologist on all skid trails crossing streams
- Consult with fish biologist when harvest will take place near ponds.
- Implement forestry BMPs for all timber sales within the project area

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